BRIEF COMMUNICATION

Targets of Learned Food Aversions in Humans

ELEANOR E. MIDKIFF AND ILENE L. BERNSTEIN

Department of Psychology NI-25, University of Washington, Seattle, WA 98195

Received 2 July 1984

MIDKIFF, E. E. AND I. L. BERNSTEIN. Targets of learned food aversions in humans. PHYSIOL BEHAV 34(5)
839-841, 1985.—In order to determine whether some nutrients are more salient targets than others for the development of learned taste aversions a large group of normal human subjects were surveyed about their experiences with such aversions. The targets of these spontaneously occurring food aversions were identified and classified into general food categories. A prominent category for human aversions proved to be foods which were protein sources. This finding was similar to our observations in the clinical setting as well as those we have obtained using an animal model. It suggests that taste and/or post-ingestive properties of protein foods may make them particularly salient targets for food aversion learning.

IN spite of major methodological limitations, principally the reluctance to administer toxic drugs or radiation to healthy subjects purely for experimental purposes, a literature focusing on taste aversion learning in humans has begun to accumulate. Interview studies have documented that many people report having experienced the development of aversions as a result of a food-illness pairing [7,10]. Controlled experiments in cancer patients receiving chemotherapy, in alcoholics, and in healthy volunteers have also demonstrated that humans, like a variety of other species, form aversions when consumption of a food or drink is followed by gastrointestinal (GI) discomfort (nausea, vomiting) [1, 3, 5, 6]. Pelchat and Rozin [11] have suggested that learned food aversions in humans tend to be particularly associated with the symptom of nausea, as opposed to other unpleasant physical symptoms such as rashes and respiratory distress. The available evidence suggests that taste aversion learning in humans shares many features with similar learning in animal species such as the rat. For example, aversions can be acquired in a single conditioning trial and are more readily learned when the target food is novel rather than familiar [1, 6, 7].

Features of the conditioned stimulus (CS) which are known to increase its associability with illness are flavor intensity and novelty [8]. However, it is not known whether some types of foods are more likely to be the targets of learned food aversions than others by virtue of their nutrient composition (independent of intensity or novelty). This question is interesting to us because we have been examining food aversions which develop in cancer patients as a consequence of the association of specific foods with their chemotherapy treatments [4]. In documenting these aversions we were intrigued to note that a substantial proportion of them appeared to be directed at foods which were protein sources (eggs, cheese, meat). Aversions to carbohydrate sources, either sweet (candies, cakes) or nonsweet (bread, potatoes), were relatively infrequent. Although this represents a potentially important finding it was based on a rather small number of subjects and its reliability and generality are difficult to assess in our patient population. In the following study we evaluated whether protein sources are more frequent targets for learned food aversions than other nutrients by surveying a large group of normal human subjects for spontaneously occurring food aversions and identifying and classifying the targets of those aversions.

METHOD

Questionnaires were distributed to undergraduate students enrolled in introductory psychology courses at the University of Washington. A total of 1495 students in four separate classes over three academic quarters responded to the questionnaire. Questionnaires were distributed in a large lecture hall during regularly scheduled class times. Completion of the questionnaires was voluntary.

The first portion of the questionnaire contained a description of a "typical" taste aversion experience, similar to one used by Garb and Stunkard [7]: "If a person becomes sick after eating a specific food, he may develop an intense dislike, called an 'aversion' for that food, whether or not it was responsible for the illness. For example, a four-year-old came down with flu several hours after eating tuna fish salad. He avoided that food for several years, even though he knew the tuna fish salad was not the cause of his illness." Subjects were then asked to respond to the question, "Have you

1Supported by U.S.P.H.S. Grant CA26419.
ever had an experience like this, which resulted in your acquiring a strong dislike for some food or drink?” Those who responded in the affirmative were asked to describe the specific food or foods which were the targets of the aversion, the cause of their illness or discomfort, their age at the time of this experience, and the duration of the aversions.

RESULTS AND DISCUSSION

Of subjects responding to the questionnaire, 57% (856 out of 1495) reported at least one aversion. This corresponds reasonably well to the 65% incidence reported by Logue et al. [10] but is considerably higher than the 38% incidence reported by Garb and Stunkard [7]. It is likely that one factor contributing to this discrepancy is the age range of the subjects. The Logue study was similar to ours in that subjects were all college undergraduates, while Garb and Stunkard surveyed subjects ranging in age from early childhood to old age.

Table 1 lists general food categories and the number (and overall percentage) of aversions reported in that category. Subjects who reported more than one aversion had each food recorded separately; thus, there are more total aversions than there are subjects reporting aversions.

If we examine those categories which would be considered major protein sources (meats, poultry, fish, casseroles, eggs, milk and cheese products), we find that they constitute 42% of all spontaneous aversions. Evaluation of the significance of this apparently high incidence of aversions to protein foods requires an assessment of the relative frequency of these foods in typical diets. To obtain this we asked a separate group of 50 students to list “everything they had to eat and drink yesterday.” This yielded 614 food items which were then assigned to the same categories as were used to classify the targets of food aversions. Chi square analyses were used to identify those food categories where incidence of aversions was significantly over-represented (or under-represented) relative to the frequency of appearance of those foods in the diet lists. Using a criterion of \( p < 0.005 \) as a conservative adjustment for multiple analyses, we found that the first two categories in Table 1 (meat, poultry and fish; main dish casseroles) were significantly over-represented in lists of aversions compared to the diet lists where they constituted only 9% and 7% of listed items.

Another prominent category which is significantly over-represented as a target of aversions is alcoholic beverages. While 14% of all aversions were reported to alcoholic beverages, only 4% of items on diet lists were in that category. These cases are probably aversions where the symptoms (nausea, vomiting) are not coincidentally, but often causally related to the ingestant. It is also likely that the percentage of aversions in this category is higher in a college-student sample than in the general population. Logue et al. [10] reported an even higher incidence of alcohol aversions—25% of all reported aversions.

Categories of foods which are significantly under-represented as targets for aversions were bread, crackers and other flour products; rice and potatoes; and dairy products. Carbohydrate foods, then, would appear to be eaten quite frequently (14% and 7% respectively) but infrequently become the targets of learned food aversions. While some dairy products are indeed major protein sources, milk and butter constituted the overwhelming majority (78%) of such items on diet lists and these bland and familiar items are unlikely targets for aversions.

Table 1 lists general food categories and the number (and overall percentage) of aversions reported in that category.

---

The observed prevalence of aversions to protein sources tends to confirm our original clinical observations. It is possible, however, that our questionnaire example (“tuna fish”) biased subjects towards listing protein foods. This seems unlikely, particularly since Logue (personal communication) also found a relatively high incidence of aversions to protein sources (approximately 36% of all aversions), and she deliberately provided her subjects with no examples of aversions.

Since a survey method has inherent limitations in assessing the generality of these findings and characterizing the mechanism responsible, we have also examined learned food aversions in rats self-selecting their diet from separate protein and carbohydrate sources during a course of chemotherapy treatments [2]. In several studies, using natural and purified protein sources, and sweet and nonsweet carbohydrate sources, we found that rats consistently developed learned aversions to the protein but not the carbohydrate source. These findings support the survey results reported here; namely, that protein sources are more salient targets for aversion learning than are other nutrients. The present findings are also supported by the findings of Kalat and Rozin [9] examining “salience” or the consistent tendency to associate poisoning with certain solutions and not with others. Salience appeared to be a factor relatively independent of palatability and, of the four solutions they examined (sucrose, casein hydrolysate, saline, and vanilla), the most salient was the casein. It is, as yet, unclear whether the prevalence of aversions to protein sources is based on flavor properties (i.e., intensity) of protein foods, and/or on their postigestive consequences. Nonetheless, these findings are
important because they suggest that consequences of chemotherapy-induced aversions may involve alterations in the nutritional quality of the diet of cancer patients, even if reductions in total calorie intake or body weight do not occur.

REFERENCES